HYDRATION POUCH WITH INTEGRAL THERMAL MEDIUM

TECHNICAL FIELD

This relates to cooled and/or heated hydration systems, particularly those configured for portable use.

BACKGROUND

The importance of maintaining adequate hydration during physical activity is well known. Water, fruit juices and other specialized drinks may be ingested to serve this purpose. To be most effective in maintaining hydration levels, frequent or continual access to a supply of liquid is preferred. Furthermore, when the fluid ingested is cooled, additional health benefits arise. Heat prostration may be more easily avoided as a result of ingesting cool liquid. Athletic performance may also be assisted by helping absorb heat from the body that otherwise contributes to fatigue. For use in cold environments however, such as when skiing, boating, ice fishing, hunting or mountaineering, heated drinking fluid is often preferred.

Numerous portable hydration systems have been developed which may be employed during physical activity. Especially for use in bicycling, a system that has become widely used includes a backpack-like structure, which contains a flexible pouch or bladder coupled to a conduit to remotely deliver fluids to a user. This type of system offers many advantages. The flexible nature of the pouch allows it to expand in order to hold a significant volume of liquid while conforming to the body of a rider. Upon drainage, the volume the pouch decreases making storage and handling easy. When worn, the backpack fits conveniently out of the way so it does not interfere with body movement. Yet, by positioning the outlet of the conduit near or at the mouth of a user refreshment is immediately available.

Such advantages are not offered by typical beverage bottles for use in cycling. They are not capable of being worn on the body comfortably due to their non-compliant nature,

which is required for handling. Further, use of a typical water bottle requires significant movement of the bottle to the mouth of a user.

Wearable flexible hydration sacs like those described above have been the subject of considerable improvement in certain areas. Improvements made to such devices include more effective valves or dispensing means such as described in U.S. Patent Nos. 5,060,833 to Edison *et al.*; 5,085,349 to Fawcett; 5,911,406 to Winefordener *et al.*; 6,032,831 to Gardener *et al.* and 6,039,305 to Hoskins *et al.* Also, U.S. Patent Nos. 5,727,714 to Fawcett and 5,806,726 to Ho describe improved interfaces between the hydration bladder and dispenser conduit.

An area in which there has been little innovation is that of maintaining the fluid within the bladder or pouch at a cool temperature, *i.e.,* at a temperature below ambient temperature, or an elevated temperature, *i.e.*, at a temperature above ambient temperature. Backpacks housing hydration bladders have been designed to include insulating material. Also, packs sized to receive both a container for liquid and be fillable with ice such as shown in U.S. Patent No. 4,196,817 to Moser have been designed. However, few modifications have been made to the structural nature of flexible pouch hydration systems in effort to provide for cool liquid within the same.

Those using standard hydration bladders sometimes fill them with ice in an effort to maintain cool temperatures for a significant amount of time. This may be accomplished as shown in U.S. Patent No. 5,806,726 to Ho by using standard ice cubes. Alternately, elongate bars of ice may be used to make filling a hydration pouch with ice marginally less burdensome. Either way, as the ice melts it dilutes any dissimilar liquid. This compromises the quality of any specialized drink used. It is a particular problem if carbonated drink is preferred. Furthermore, the production and handling of the ice is not ideal. Issues ranging from inconvenience to contamination arise. Also, use of ice within a bladder prevents the consumption of its full contents until all the ice melts, thus hindering hydration efficiency.

Another problem with existing hydration pouches is the difficulty experienced

in filling the same. Adhesion between opposite sides of the bladder, and the lack of locations to effectively grip the same can make filling messy, troublesome and wasteful of drinking fluid spilled in the struggle.

Therefore, need exists for a hydration system in which more effective cooling or heating or temperature maintenance of fluid within a flexible sac can be achieved. Further, need exists for a flexible hydration pouch which is more easily filled than those presently available. The present invention meets these needs and others not expressly mentioned, but which may be readily appreciated by those with skill in the art.

SUMMARY OF THE INVENTION

The present invention is a hydration system with integral thermal medium. It includes a sac or pouch with a sealable inner compartment for drinking fluid and at least one outer compartment filled with cooling and/or heating medium or a medium suitable for either application. Any such medium may be referred to as a thermal capacitance medium. The pouch may be provided by a first bag located within a second bag with the cooling and/or heating medium provided there between. Alternately, it may be provided by a first sleeve, within a second sleeve with cooling and/or heating medium between each. Still further, the pouch may be such that one or both sides include pocket(s) or panel(s) filled with medium. Other configurations in accordance with the present invention are possible as well.

The thermal capacitance medium may be water, a gel or another material, which can be repeatedly chilled and/or heated. Once its temperature is altered, the medium effectively maintains fluid within the pouch at depressed or elevated temperature for some time.

The hydration system may include a conduit for providing fluid stored within the pouch to a user. This may be capped by a valve to be articulated by a user to dispense fluid. The system may also include a wearable housing or harness to receive the pouch. Preferably, the housing includes thermal insulation.

BRIEF DESCRIPTION OF THE DRAWINGS

The following figures diagrammatically illustrate exemplary aspects of the present invention with similar features in the various figures correspond to those enumerated in others:

Figure 1 shows an overview of the present system;

Figures 2A, 2B and 2C show integrally cooled hydration pouches in partial cutaway;

Figures 3A and 3B show optional wall configurations for the integrally cooled hydration pouches;

Figures 4A and 4B show cross-sectional configurations useable for the integrally cooled hydration pouches.

DETAILED DESCRIPTION

The integrally-cooled pouch described herein is advantageously incorporated in a "camel back" type hydration system or arrangement like that described in U.S. Patent No. 5,060,833 to Edison noted above and/or includes such features as described in U.S. Patent Nos. 4,420,097 to Motsenbocker; 4,948,023 to Tripp; 5,085,349 to Fawcett; 5,282,557 to McCook; 5,427,290 to Thatcher; 5,722,573 to Camel; 5,727,714 to Fawcett; 5,806,726 to Ho; 5,864,880 to Adam; 5,911,406 to Winefordener *et al.*; 5,941,640 to Thatcher; 5,975,387 to Gleason *et al.*; 6,032,831 to Gardener *et al.*; and 6,039,305 to Hoskins *et al.*

As shown in Figure 1, the inventive system may include a pack **2** adapted to house a hydration pouch **4**. Various manufacturers produce packs suitable for such use. Exemplary packs include those sold by K2 Bike (Vashon WA), CamelBak (Weatherford TX), Blackburn Designs (San Jose CA), and Performance Bicycle Inc. (Chapil Hill NC).

The pack **2** includes a housing portion **6** with an access zipper **8** and straps **10**. Hydration pouch **4** is shown within the pack **2**. The pouch **4** shown is fluidly connected to a conduit **12** including a valve **14** to prevent inadvertent draining of the pouch **4**. Conduit **12** may be insulated. For instance a neoprene sleeve, such as produced by Lizards Skins (Pleasant Grove UT) may

be used. The valve **14** is preferably a bite-valve articulable by the jaws of a user. The conduit **12** may be connected to the pouch **4** via a fitting **16**. The pouch includes a sealable opening **18** through which it may be filled. The pouch may further include a hanger section **20**.

Though not pictured in this manner, the opening to the pouch **4** may be designed to accept an end of the conduit as depicted in U.S. Patent No. 5,722,573 to Camel. Whatever the case, the inlet of the conduit **22** is preferably attached at a lower portion of the pouch **4** when it is to be utilized in conjunction with a backpack as shown in order to facilitate full evacuation of liquid from the pouch **4**. An exemplary hydration pouch lacking the integral cooling structure of the present invention, but otherwise having components useable in the present inventions, is sold by K2 Bike.

In the present invention, material forming portions of the pouch **4** intended to contact fluid for drinking preferably comprise such materials as commonly used in other flexible hydration bags, pouches, bladders or the like produced by companies such as Gregory Manufacturing Inc. (Holeyoke MA) and Dielectrics (Chicopee MA). Suitable materials include, but are not limited to polyethylene, urethane, polyurethane, polystyrene, and nylon.

The inventive hydration pouch **4** described herein may be utilized as part of a larger hydration system including a backpack or harness **2** or be used independent of such structure. The pouch itself is distinguishable from known hydration pouches designed for similar use in that it integrally includes provision for cooling and/or heating or maintaining the temperature of fluid filling the same at an elevated or depressed temperature. Variations on how integration of the thermal capacitance medium **24** into the pouch may be achieved are described below. First, however, preparation of the pouch **4** for use is described since this is common to such variations.

To prepare a pouch **4** as shown in the figures for use, it may be placed within a freezer when empty to cool the pouch well below the ambient temperature at which the pouch will be used to dispense fluid. Chilling the bag below 0°C is preferred. It is most preferred to chill the pouch **4** to as low a temperature as is conventionally possible by a typical freezer or out-of- doors. After chilling, the pouch **4** is filled with liquid. Such liquid may itself be chilled. It is also possible to

fill the pouch with ice, though this may not be preferred for reasons as discussed above. Alternately, the pouch **4** may be heated, for instance, by placing it in a microwave. The duration and intensity of such heating is easily controlled by a user. Drinking fluid at ambient temperature may be poured into the pouch **4** prior to application of heating energy. Alternately, preheated liquid may be added to the pouch **4** prior to or after heating the pouch **4**.

In each variation of the present invention, thermal medium **24** may be water, a gel or other material that may be effectively chilled and/or heated. The material or materials chosen should have a high specific heat or heat capacity in order to best cool and/or heat or maintain a low or a high temperature of fluid within the pouch **4**. A preferred medium **24** for cooling comprises a non-toxic refrigerant gel of conventional formulation. Compositions that may be suitable for medium **24** include water and propylene glycol or a cellulose ether, those described in U.S. Patent Nos. 6,044,201 to Van Turnhout and 5,035,122 to Oogjen (and references cited in each), those used/produced by Consolidated Products and Services, Inc. (Braintree, MA), or as used in commercially available gel packs for cooling and/or heating including Nexpare™ (3M: St. Paul, MN), PolyBag™ (Super Ice Corporation: San Leandro, CA).

When medium **24** is a cooling medium, when placed in a typical freezer, it preferably sets-up at least partially. In some instances, it may become solid. In others, it will remain pliable. It is preferred that it remains somewhat pliable. Such a condition enables a user to inflate the pouch **4** with air, upon which the chilled cooling material **24** causes the pouch to remain substantially open thereby facilitate filling with liquid. This alleviates such fill problems as commonly experienced with typical hydration pouches as noted above.

Various configurations are possible for use in providing a hydration bag according to the present invention. Furthermore, it is to be understood that the hydration pouch of the invention can be used in other settings or in conjunction hardware other than a backpack or harness **2** such as shown in Figure 1. Furthermore, the pouch may be used without a conduit designed to facilitate remote consumption of liquid from the pouch. Alternately, a spicket or

valve may be provided apart from the cap. Still further, the cap **18** may be the only opening (a friction fit or a screw fit may be used as seal) or it may include a valve itself. Nonetheless, Figures 2A-2C provide various examples of forms that the integrally cooled hydration pouch **4** may take, particularly for use in a "camel back" arrangement.

Figure 2A shows an advantageous configuration wherein the pouch **4** is made in layers formed by an inner bag **26** surrounded by an outer bag **28**. Preferably they will be made of similar material so welding may easily join them. The bags **26, 28** may be affixed to each other along end sections **38** as indicated by the darkened bar. Alternately, the outer bag **28** may be attached to the inner bag **26** at a lower level. Attachment may be accomplished by heat sealing or welding the material together. Typical heated elements, ultrasonic or chemical welding may be employed for welding. Alternately, desired sealing may be accomplished using silicone gel, adhesives or otherwise. The same joining methods may be used in any variation of the pouch **4**.

Each of the bags **26, 28** may be formed from sheet material folded over and joined to form the desired shape or otherwise. The inside of the first bag **26** provides an interior compartment **30** in the pouch **4** for containing consumable fluid. The space **32** between the outside for the first bag **26** and inside of the second bag define layers **28** of the pouch **4** and is filled with cooling medium **24**.

Regardless of the configuration, the thermal capacitance medium filling space within the pouch **4** is preferably uniformly distributed. Where a gel is used, an even amount about 3 mm to 10 mm on each side of the pouch **4** is preferred. Utilizing about 12-20 fluid oz., preferably 16 fluid oz., of medium **24** (such as a gel) for a hydration pouch having a capacity of about 70 fluid oz. insures adequate heat/cold capacity. Still, it is to be understood that other configurations and sizing of the pouch **4** are within the scope of the invention.

Figure 2B shows a second variation of the inventive pouch **4** where an inner sleeve **34** is surrounded by an outer sleeve **36** to provide the inner and outer layers forming the desired

drinking fluid compartment **30** and medium space **32**. As shown by the darkened bars, the end sections **38** of the sleeves **34, 36** are joined together. Alternatively, the outer sleeve **36** may be joined to the inner sleeve **34** at some distance from the end sections **38**. As with the bags of the variation shown in Figure 2A, the sleeves used in this variation of the invention may be formed from sheets of material.

As shown in Figure 2C, the inventive pouch **4** may also be made from sheets or panels **40** of material without first forming such sheets into bags or sleeves. Here, the compartment **30** between the inner layers and the spaces **32** between the inner and outer layers are formed between the sheets **40** welded or joined, around the periphery **42** of the pouch **4**. Alternately, smaller panels **40** to form space for the cooling medium **24** may be joined to the inner layer or layers of the pouch inboard the edge **42**. Furthermore, more than one receptacle space **32** for cooling material **24** may be formed on a given side of the pouch **4**.

While a four-ply construction is shown, a three-ply construction is also contemplated. In such a configuration, a compartment **30** for drinking fluid is provided with space(s) **32** for cooling medium provided on only one side of the fluid compartment.

In all variations of the inventive pouch **4**, where the entire interior compartment **30** is not surrounded by medium **24** as depicted in Figures 2A-2C, the structure provided to receive medium **24** will be configured so that it substantially surrounds or covers the interior compartment **30**. This means at least one-third to half of the surface area of the compartment **30** is in contact with medium **24**. More preferably, three-quarters or more of the surface will be covered. Most preferably, all, or significantly all the surface of the drinking fluid compartment **30** is surrounded by or in contact with the thermal medium. Therefore, while only one side of each of the variations shown in Figures 2A-2C is shown, it is to be understood that both sides should include medium **24** or one side should be largely covered.

Furthermore, in all variations of the invention, provision is made to close the interior compartment **30** of the pouch **4** in order to avoid the escape of drinking liquid. A friction-fit

removable cap **18** is preferred for a Camelback® type arrangement. Alternately, a screw-type cap assembly may be preferred. Whatever the case, the cap or any fitting associated with the same should open only to the interior compartment **30**. Any outer bladder, receptacle or compartment **32** for receiving medium **24** is isolated from the opening of the pouch **4** by welding or another barrier such as a layer of silicone. Similarly, where a conduit **12** is provided to evacuate the pouch **4**, the opening to the conduit or any fitting associated with the same should open only to the interior **30**.

It is to be understood that the gel-filled sections **32** of the pouch **4** may be left inviolate or may be interrupted. Such sections may be interrupted by structures preferably provided by welding the inner and outer layers **44** of the pouch together. Such interruption assists in maintaining even distribution of cooling medium **24**, a matrix of circles or dots **46** as shown in Figure 3A may be most effective in this regard. Alternately, one or more striped sections **48** as shown in Figure 3B may be provided. Naturally, the orientation, width or other parameters of the striping may be varied.

The use of elongate breaks or striations **48** in the coverage of the cooling medium may be particularly providing the pouch with flexibility since, gaps **50** in the coverage of the cooling medium **24** may act somewhat like a hinge. In a similar vein, where multiple pockets or receptacles **32** are to be provided to hold cooling and/or heating material, they may also be arranged to promote flexibility or filling of the pouch **4**. In either instance, breaks in the coverage of the thermal medium of the interior compartment **30** should not be so great as to significantly reduce the capacity to cool and/or heat or maintain drinking fluid at an acceptably low or high temperature. Accordingly, the medium-coverage parameters discussed above should be observed.

Figures 4A and 4B show cross-sectional configurations useable with any of the variations of the pouch **4** of the present invention. The pouch may have a simple two-sided bladder shape as shown in Figures 4A. Alternately, it may include one or more expansion

sections or pleats **52** adjacent to the opposite sides of the pouch **4** as shown in Figure 4B. Each configuration is advantageous in that it will more easily collapse in a flattened manner upon draining than other shapes. Each cross section shows the drinking fluid compartment **30** and areas that may be filled with cooling medium **24**.

It is contemplated that the inventive bladder **4** may have other cross-sectional shapes as deemed convenient for the setting in which it is to be employed. For example, it may be rounded *(e.g.,* circular, elliptical, ovolaid or oblong) or rectilinear *(e.g.,* square or rectangular). Also, the pouch **4** may have a differing plan view than those depicted in Figures 2A-2C. For instance, instead of having a projected view that is basically rectangular as shown, it may be configured substantially in the form of a square, circle, another regular geometric shape or otherwise depending on its intended use.

Regardless of the configuration of the pouch **4**, a sling, sidepack or type of bag other than that shown in Figure 1 may be preferred to house the pouch **4**. In addition, it is contemplated that the inventive pouch may be configured to integrally include carrying structure(s) such as strap(s), a belt, sling or harness. Optional housings or carrying structures are illustrated in the references listed above.

Finally, it is noted that this invention has been described and specific examples of the invention have been portrayed. The use of those specific examples is not intended to limit the invention; only the appended claims shall do so. Additionally, to the extent that there are variations of the invention, which are within the spirit of the disclosure and/or are equivalent to features found in the claims, it is intended that the claims cover those variations as well. All equivalents are considered to be within the scope of the claimed invention, even those which may not have been set forth herein merely for the sake of brevity. The disclosure of each of the patents cited above is incorporated by reference herein in its entirety.